Graphic Inquiry:

Dynamic Differentiation and Digital Age Learning

By Annette Lamb and Larry Johnson

Each student is unique. The teacher librarian plays an important role in matching resources and technologies to the individual needs of young people.

By partnering with grade-level and departmental teams, the teacher librarian can focus on the needs of subgroups of students within the school, developing learning experiences that address student readiness, personal interests, and engaging choices.

Back in the 1990s, the process of "differentiated instruction" was identified by Carol Ann Tomlinsonas a way to provide varied avenues for students to construct knowledge. Over the past decade, the approach has been applied to the process of combining traditional resources with twenty-first century technologies to meet the needs of all students.

DYNAMIC DIFFERENTIATION: AN EXAMPLE

We'll use the book *The Jewel Fish of Karnack* by Graeme Baseas an example. Watch the **Author's Introduction** (youtube.com/watch?v=72MViFwy02U) to learn more about the author, book, and game. Then read the book. Go to the website to solve the **Puzzle** (www.graemebase.com). Use **KeepVid** (keepvid.com) to download the video for use with a class.

Let's consider the many ways this book could be used to jumpstart learning.

First, think about how the book mixes nonfiction with a fictional story. For instance, reading the inside of **The Jewel Fish of Karnak** book cover provides background information related to the story set in Ancient Egypt. *How could you connect other works of fiction with factual information and content area standards?*

Second, look for visual elements, codes, games, and other elements that will bring content area learning alive. For instance, **The Jewel Fish of Karnak** includes history-based characters, hieroglyphs, and other interesting elements. *What other picture books have interesting visual elements that could expand interest?*

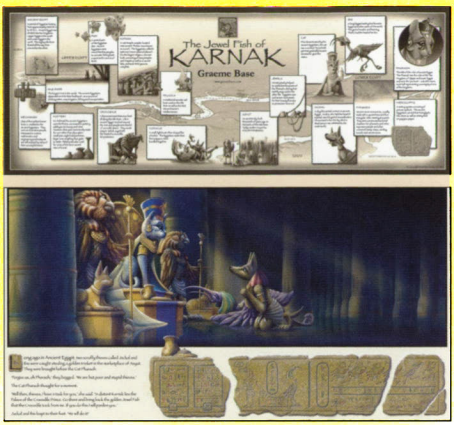

Figure 1. The Jewel Fish of Karnak by Graeme Base.

Third, use the author's website materials, including videos, games, mysteries, and other elements, to bring reading alive. For instance, Graeme Base's website contains a video that introduces the book, a game area, and other interesting information. *What authors have resources that you can use to expand a reading experience?*

The Problem . . . *Most books don't have great nonfiction resources and fun games.*

The Solution . . . *Build your own!*

To find great resources, do a Google search for your topic and add the word "pathfinder" to see what other librarians and classroom teachers have created, such as **Ancient Egypt** (pathfinder-ancientegypt.wikispaces.com/).

There are many great books set in Ancient Egypt, such as:

The 5000 Year Old Puzzle by Claudia Logan
Bill and Pete Go Down the Nile by Tomie dePaola
Cleopatra VII: Daughter of the Nile by Kristiana Gregory
Egyptian Cinderella by Shirley Climo
I Am the Mummy Nefert by Eve Bunting
Mrs. Frizzle's Adventures in Ancient Egypt by Joanna Cole
Mummies in the Morning by Mary Pope Osborne
Muti's Necklace by Louise Hawes
Pepi and the Secret Names by Jill Paton Walsh
Sphinx's Princess by Esther Friesner
The Time Warp Trio: Tut, Tut by Jon Scieszka
We're Sailing Down the Nile by Laurie Krebs and Anne Wilson

Much of *The Magic and the Mummy* by Terry Deary can be read at **Google Books** (books.google.com/books?id=l6THZpleqMIC). Use these previews to generate interest.

Infuse quality nonfiction resources associated with fictional works :

BBC: www.bbc.co.uk/history/ancient/egyptians/

British Museum: www.ancientegypt.co.uk/

Canadian Museum of Civilization: www.civilization.ca/cmc/exhibitions/civil/egypt/egypt_e.shtml

Egyptian Mythology: www.pantheon.org/areas/mythology/africa/egyptian/articles.html

Eternal Egypt: www.eternalegypt.org/

Great Scott: www.greatscott.com/hiero/index.html

Hieroglyphs: hieroglyphs.net/000501/html/000-042.html

Mr. Donn's Ancient Egypt: egypt.mrdonn.org/

Museum of Science: www.mos.org/quest/

National Gallery of Art: www.nga.gov/exhibitions/2002/egypt/

National Geographic: www.nationalgeographic.com/pyramids/

Neferchichi's Tomb: www.neferchichi.com/

NOVA Ancient: pbs.org/wgbh/nova/ancient/explore-ancient-egypt.html

Odyssey Online: carlos.emory.edu/ODYSSEY/EGYPT/homepg.html

PBS Egypt: pbs.org/empires/egypt/special/lifeas/index.html

PBS Lost Empires: pbs.org/wgbh/nova/lostempires/obelisk/

PBS Pharaohs: pbs.org/wnet/pharaohs/

Royal Ontario Museum: www.rom.on.ca/programs/activities/egypt/learn/

Scholastic Egypt: teacher.scholastic.com/lessonrepro/lessonplans/theme/egypt.htm

Smithsonian Journey: www.smithsonianjourneys.org/blog/tag/egypt/

Tour Egypt: www.touregypt.net/kids/

Integrate graphic and interactive elements:

Go to NOVA to do a 360-exploration virtual trip (pbs.org/wgbh/nova/ancient/explore-ancient-egypt.html).

Go to Discovery to Build a Pyramid (www.discovery.com/games/pyramid/pyramid.html).

Locate charts, timelines, and maps at the Royal Ontario Museum (www.rom.on.ca/programs/activities/egypt/learn/).

Try the hieroglyphic typewriter (www.eyelid.co.uk/hieroglyphic-typewriter.html).

Try the hieroglyphic translator (ngm.nationalgeographic.com/ngm/egypt/translator.html).

Make your own cartouche (www.harcourtschool.com/activity/cartouche/cartouche.html).

Try iPad apps like Egypt Engineering (http://itunes.apple.com/us/app/history-egypt-hd/id428936764?mt=8).

Explore student projects (http://www.hitchams.suffolk.sch.uk/egypt/index.htm).

DYNAMIC DIFFERENTIATION: TRY IT

Select a visually rich book and consider the many ways that fiction and nonfiction materials could be incorporated into the learning experience. Also think about the visual elements that could attract students and enhance understanding.

For instance, **Wonderstruck** (www.wonderstruckthebook.com) by Brian Selznick tells two stories: one visual and one text. **Google Books** (books.google.com/books?id=5VY8FaCYDWAC) has a nice preview to give you a sense of the book.

Students can connect the visuals in the book with factual information by reading about **Wonderstruck Essays** (www.wonderstruckthebook.com/essays.htm).

The book's interesting themes can be explored through such nonfiction resources as ASL (American Sign Language, aslpro.com), the **American Museum of Natural History** (www.amnh.org), and the **Museum of Jurassic Technology** (www.mjt.org).

By exploring the **Wolf Diorama** at the American Museum of Natural History (www.amnh.org/exhibitions/dioramas/wolf), students become immersed in the real-life elements of the story through images and a video tour.

DIFFERENTIATE WITH GRAPHICS

Some students learn successfully with just a lecture and textbook. However, others need lots of practice, a chance to explore a range of resources, and various examples and experiences. Think about how graphic resources and technologies can be woven into the content, process, and products associated with learning.

According to Lamb and Callison (2012, 101) in **Graphic Inquiry**, "as you match information and content-area standards with types of graphics that young people may use as part of an inquiry, consider activities that will address individual differences."

For instance, think about ways to transform the exploration of acid rain, the water cycle, and the environment through the use of graphics.

A learner who has difficulty with a traditional written science log assignment may be more successful photographing the process.

A learner may use a map to better understand the relationship between weather patterns and acid rain.

A learner may use historical photos to see how smoke and acid rain impact cars.

A Venn diagram may be used to compare sources of pollution in two countiesA timeline may document changes in air-quality regulation over time.

SIX TYPES OF GRAPHICS FOR DIFFERENTIATION

From organizing research questions on a concept map to mapping out ideas for a nature trail, graphics can be woven throughout the inquiry process. Visual elements can provide a critical context for understanding.

However, Lamb and Callison (2012, 102) point out that "while some children may be ready to understand abstract representations, others may not. It's easy to assume that children can read and understand comics, maps, and photographs, but don't make assumptions. Before beginning an inquiry involving graphics, assess the developmental levels of your children. Are they ready to handle a visual that involves scale or symbols? Can they follow the sequence of a comic string or the elements of a diagram."

As students use graphics in learning, design activities that involve students in analyzing and evaluating visual resources as well as creating their own.

Let's explore six types of graphics that

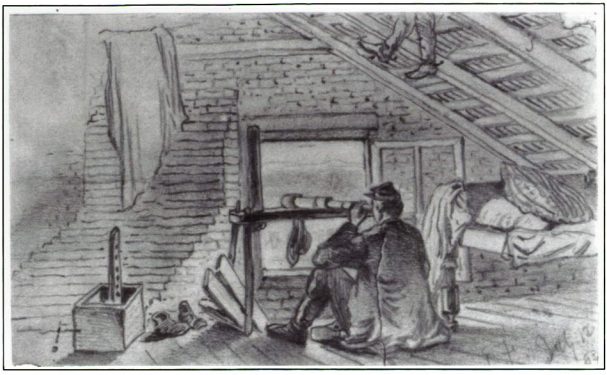

Figure 1. Civil War Drawings from the Library of Congress. http://www.loc.gov/pictures/item/2004661884/ http://www.loc.gov/pictures/resource/cph.3a02858/

work well for differentiation: data sets, illustrations, infographics, maps, organizers, and photos.

Data Sets. Data sets are collections of facts that are the result of observation, experience, or experiments. Students can use charts and graphics to better understand data and convey their own work.

Young people enjoy timely information that connects with their life. Involve students in using information from the **2010 US Census** (2010.census.gov/) in their inquiries. Start with national data and ask students to look at state and local trends.

In **The First Measured Century** from PBS, data are used to show trends from 1900–2000. You can download the book at PBS as a PDF (pbs.org/fmc/downloadbook.htm), read much of it on **Google Books** (books.google.com/books?id=ph1UKg3y0NUC), and also explore the **PBS website** (www.pbs.org/fmc) for text, graphics, and video.

Involve students in analyzing existing data sources and collecting their own data. For instance, students might compare the chart found at **USA Today Snapshots** (www.usatoday.com/news/snapshot.htm) with an inventory of the food in their own home. The online tool **Create a Graph** (nces.ed.gov/nceskids/createagraph) works well for students making their own graphs.

Keep it simple. Read the children's book **Right Outside My Window** by Mary Ann Hoberman. Create a predicted and actual temperature chart. Have students take photographs of the different seasons.

Involve high school students in creating their own online polls using tools such as **Zoho Polls** (zohopolls.com), **Flisti** (flisti.com), and **Survey Monkey** (www.surveymonkey.com).

Many interactives can help students collect data for their own projects. Read the **Science of Cycling** (exploratorium.edu/cycling). Go to the **Free Ride** interactive (illuminations.nctm.org/ActivityDetail.aspx?ID=178). Also check the **Illuminations Activities** website (illuminations.nctm.org/ActivitySearch.aspx) for more ideas.

Illustrations. From sketches and line drawings to painting and posters, illustrations help students visualize ideas and concepts. Challenge student thinking by presenting young people with unusual images. For instance, many students have seen Civil War photographs, but have they seen drawings from that era? Explore drawings at the **Library of Congress Civil War Drawings** page (memory.loc.gov/ammem/awhhtml/awpnp6/Drawing.html). For instance, explore drawings of everyday life beyond combat.

Use visual variety to enrich the learning experience. Involve students in analyzing illustrations. Explore **WPA Posters** from the Library of Congress (memory.loc.gov/ammem/wpaposters/wpahome.html). Ask such questions as:

Who created it?

What's the purpose?

What's the intended audience?

Was the image created from firsthand experience?

Is it truthful?

Is it posed?

Is it biased?

Is it time specific?

Comics and illustrated books are being produced by many groups and distributed online. For instance, read comics from federals agencies such as **On the Trail of the Missing Ozone** (www.epa.gov/ozone/science/missoz/) and **Ready Kids** (www.ready.gov/kids/fun/comic1.html).

Show students public service announcement comics such as **Bat Bites** (www.azgfd.gov/i_e/ee/resources/posters/bat_comic.pdf). Then ask them to create their own using such tools as **MakeBeliefsComix** (www.makebeliefscomix.com), **Pixton** (www.pixton.com), and **ToonDo** (www.toondoo.com).

CONNECT GRAPHIC HISTORIES WITH PRACTICAL VISUAL PRODUCTS

Read **Journey to Mohawk Country** (www.firstsecondbooks.com/mohawk.html). Compare the original journals to the graph-

Figure 4. Fire Safety Comic Using Pixton.com.

ic history. Explore student projects at the **Kids Illustrate** (kidsillustrate.blogspot.com/2010/11/journey-to-mohawk-country.html) blog. Involve students in creating their own graphic history.

Infographics. Infographics have become a popular way to visually represent many forms of information. Students develop and apply evaluation skills when they analyze infographics such as **The Tongue** (www.infographicsshowcase.com/wp-content/uploads/2010/09/tongue-infographic.jpg). Ask students to create their own visual representations. For instance, they might select another part of the body, such as the nose or ear, and generate their own infographic.

Explore the **Top 100 SciFi and Fantasy Books** infographic (www.coolinfographics.com/blog/2011/10/12/top-100-scifi-and-fantasy-books-flowchart.html). Ask students to create their own infographic of favorite books.

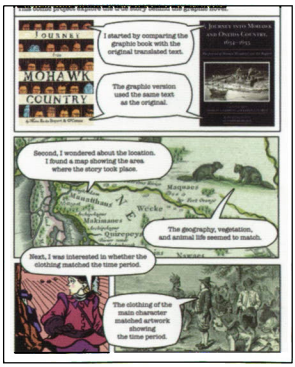

Figure 5. *Journey into Mohawk Country* Comparison.

After examining the infographic **A Disaster for FEMA** (www.coolinfographics.com/blog/2011/9/30/a-disaster-for-fema.html), provide students with resources to learn about one of these types of disasters. They can then create their own infographic.

Explore the **How Dangerous Is Your House?** infographic (www.coolinfographics.com/blog/2011/9/8/how-dangerous-is-your-house.html). Involve students in conducting their own study of household dangers.

The Learning Network at the *New York Times* presents a nice article series on teaching with infographics across content areas:

Teaching with Infographics: Places to Start: learning.blogs.nytimes.com/2010/08/23/teaching-with-infographics-places-to-start

Teaching with Infographics: Social Studies: learning.blogs.nytimes.com/2010/08/24/teaching-with-infographics-social-studies-history-economics

Teaching with Infographics: English: learning.blogs.nytimes.com/2010/08/26/teaching-with-infographics-language-arts-fine-arts-and-entertainment

Teaching with Infographics: Science and Health: learning.blogs.nytimes.com/2010/08/25/teaching-with-infographics-science-and-health

Maps. Maps are a powerful way to meet the visual needs of young people. They can help students identify locations, routes, and patterns.

Explore the **Cancer Mortality Maps** (ratecalc.cancer.gov) and speculate on why some areas have more of a particular type of cancer. Ask students to locate evidence to support their claim.

Explore **HowBigReally** (howbigreally.

WEB SITES

APPS

FOR STUDENTS:

The Lorax: Dr. Seuss. Oceanhouse Media, Inc. $4.99. Android, iPhone, iPad, iPod Touch. With the new movie, interest in **The Lorax** is high. Enhanced book app features read-to-me, read-it-myself, and auto play. Words are highlighted as narrator reads. Tap on objects to see labels, such as grackle-grass, smog, and the Once-ler.

Monkey Maths. DiJa Software. $0.99. iPhone, iPad. More like interactive flash cards than a true game, the app makes necessary drills more engaging. Test yourself on addition, subtraction, multiplication, and division. **Monkey Maths Pro** by Which Way is Down Productions, also $.099, works with Android, although its "monkey" resembles a gorilla.

National Flags Quiz. FractalGate. Free. Android, iPhone, iPad, iPod Touch. Match flag to country, or vice versa. Timed quizzes offer three levels of play with option to limit countries to United Nations members.

Sight Word Bingo. Rocking Pocket Games. $0.99. Android, iPhone, iPad, iPod Touch. Listen to the spoken word (can be repeated), then tap on the matching square to reveal farm animal. Five in a row equals Bingo! Five levels of play from pre-primer to grade 3. Typeface is small on smart phones, and voice occasionally sounds like the old Speak & Spell, but it beats flash cards.

com) to help students visualize sizes in the world. Use **Google Maps** (maps.google.com) to create your own map.

Explore **A Literary Map of Manhattan** (www.nytimes.com/packages/khtml/2005/06/05/books/20050605_BOOKMAP_GRAPHIC.html). Ask students to make one for their state, city, or country.

Examine the **Lyme Disease Map** (www.cdc.gov/niosh/topics/lyme). Make predictions using evidence to support it.

Use the **US Government Map Master List** (www.usa.gov/Topics/Maps.shtml) for many more map examples.

Think about activities that involve students in analyzing and creating maps. Explore other maps such as the **CDC Flu Map** (www.cdc.gov/flu/weekly/usmap.htm), **Environmental Disasters** (howbigreally.com/dimension/environmental_disasters), **Tracking the Oil Spill** (www.nytimes.com/interactive/2010/05/01/us/20100501-oil-spill-tracker.html#composite), and **Water Maps** (water.usgs.gov).

Explore a class project called **Mapping the World by Heart** (connections.smsd.org/el/mapping.htm). They used the **Mapping the World by Heart** materials as the basis for their project.

Organizers. Organizers help young people think about the content they are exploring. Use concept maps, timelines, comparison charts, and other organizers as an alternative to traditional writing activities. After reading **First the Egg** by Laura Vaccaro Seeger, ask students to create an organizer showing the entire process for one of the examples in the book. Use such software as **Kidspiration** or **Inspiration.**

Use organizers as a guide for writing. Some students have a hard time getting started. Ask them to make a likes and dislikes chart for preplanning. While reading **The Calder Game** (www.bluebalLiettbooks.com/caldergame.html) by Blue Balliett, students can reflect on photographs of sculptures.

In the article **Guiding Students with Eight Types of Graphic Organizers,** Gallavan and Kottler describe how organizers can be used to share knowledge. Their project explored the topic of Henry VIII. However, the eight types of graphic organizers can be applied across the curriculum, such as to the study of animals using book like Nic Bishop's **Marsupials** (nicbishop.com). As students conduct inquiries, they can share their understandings in the following categories:

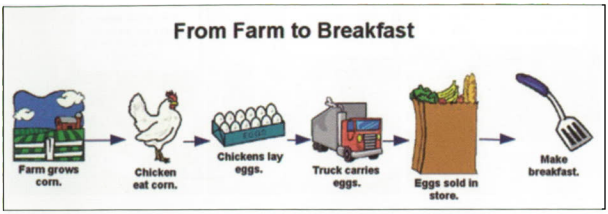

Figure 6. Kidspiration Project "From Farm to Breakfast."

- Assume and anticipate
- Position and pattern
- Group and organize
- Evaluate and estimate
- Compare and contrast
- Relate and reason
- Identify and imagine
- Combine and create

Organizers are a great way for students to consider key ideas before they begin a writing project. They are also a great way to discourage plagiarism by asking students to visualize the key concepts rather than copying and pasting.

Photos. With easy access to digital cameras, think about ways to differentiate using photography. Involve students in photographing both the process and products involved in projects. Read **Diary of a Worm** (books.google.com/books?id=a0CFgwcm9lgC) by Doreen Cronin. Use a digital camera to photograph a composting project. Then create a visual report using **Comic Life** software.

Teach young people to critically analyze photographs. For instance, Edward S. Curtis's photos of Native American people are well known from history. Are they stereotypes? Are they posed? Does this make a difference? Do they reflect the times they were taken?

Ask students to think about the use of photo editing tools. How does cropping an image impact the message? In his book **How to Interpret Visual Resources,** Harry Stein stresses four ideas when examining images:

- First impressions
- Feelings
- Connecting to personal experiences
- Last impressions: revisiting an image

Use **DocsTeach** (docsteach.org) from the Library of Congress to help students analyze and work with images as visual evidence.

DIFFERENTIATION, GRAPHIC INQUIRY, AND THE TEACHER LIBRARIAN

Graphic inquiry involves weaving visual representations throughout the inquiry process. The teacher librarian can partner with classroom teachers to infuse graphic representations into text-heavy lessons.

For instance, a poetry unit focusing on

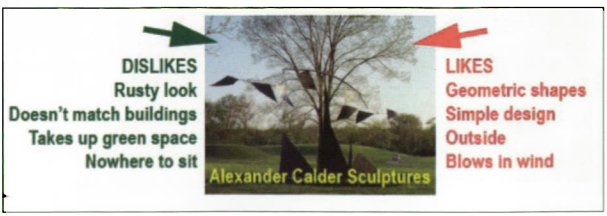

Figure 7. The Calder Game Reflection.

Figure 5. Diary of a Worm Comic Project.

the works of Walt Whitman might incorporate the award-winning picture book Walt Whitman: Words for America by Barbara Kerley. In addition, historical photos and other primary sources from the Library of Congress Poet at Work collection (memory.loc.gov/ammem/collections/whitman/) could help students envision the time and place the works were written.

When working with teachers, explore ways to differentiate throughout the learning experience.

Content. Rather than all students reading the same book, the teacher librarian might recommend a variety of books that provide different ways of thinking about the content and varied reading levels, such as *Uno's Garden* by Graeme Base and *The Evolution of Calpurnia Tate* by Jacqueline Kelly. Both books approach the topic of nature in a different way.

Process. Students may have choices in the topics they select as they are exploring the resources. For instance, they might all use the website e-nature (enature.com/fieldguides) but be given the choice of exploring field guides from different areas of the United States.

Product. While some students write paragraphs, others may create a map, chart, graph, or scrapbook of their results.

When we combine graphic elements and engaging environments with inquiry-based learning, we have a dynamic environment for differentiated, digital-age learning.

REFERENCES

Alvarado, Amy Edmonds, & Herr, Patricia (2003). *Object-Based Learning Using Everyday Objects.* Corwin Press.

Gallavan, Nancy P., and Kottler, Ellen (2010). Visualizing the life and legacy of Henry VIII: Guiding students with eight types of graphic organizers. *Social Studies,* 101(3), 93–102.

Lamb, Annette, and Callison, Daniel (2012). *Graphic Inquiry.* Libraries Unlimited.

Stein, Harry (1983). *How to Interpret Visual Resources.* Franklin Watts.

Examples drawn from Annette Lamb and Daniel Callison's new book, Graphic Inquiry, *from Libraries Unlimited, available spring 2012.*

Adapted from a presentation titled "Graphic Inquiry and Differentiation," available at http://eduscapes.com/sessions/graphic/dynamic.htm.

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